Report

Open Program

Thomas van der Molen

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| **Project Information** | |
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| Project Name | Open Program |

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# Recap

During the AI Advanced Semester, every student was intended to spend 4 hours each week from week 2 – 17, self-improving within the Advanced AI domain. This Open Program had the goal to help students more easily achieve the necessary learning outcomes.

To achieve this goal, at the start of the semester, I had created a project plan with timeline and my thoughts/approach of the different parts that I would be tackling. To know more about this part of the open program I would highly recommend reading the [Open Program Plan](https://github.com/Thomas-Molen/FHICT-S7-AI/blob/main/Open%20Program/Open%20Program%20Plan.docx).

# Summary

I spent my Open Program, on three different major parts; Finding the perfect graduation internship, doing preliminary research on a possible AI Powered Integration Testing tool and spending additional time than planned (by Fontys) on several exercises/workshops.

For my graduation internship, I spent time improving my “marketability” such as improving my [LinkedIn](https://www.linkedin.com/in/thomas-van-der-molen-6427a7181/) with recommendations, creating a [portfolio website](https://thomasmolen.com/) with working demos of previously done projects, [updating my CV](https://thomasmolen.com/files/CV-Thomas-Van-der-Molen.pdf) and creating an [internship candidates list](https://docs.google.com/spreadsheets/d/1emdglR9FHcvxlTxmePtg5POw13pKHU7Rqjw6twRl2gQ/edit?usp=sharing). This additional work ended up giving me ample choice for possible internship positions with me choosing an internship at [Info Support](https://infosupport.com/).

Furthermore, I spent a significant amount of time researching topics related to integration testing, and possible leveraging opportunities of AI within this domain. This research creating a clearer vision and direction for a possible project based on this idea, which I ended up executing on during my Data Driven Innovation Challenge, with all findings during the Open Program phase being incorporated in the [Innovation Challenge plan](https://github.com/Thomas-Molen/FHICT-S7-AI/blob/main/Data%20Innovation%20Challenge/DataDrivenInnovationChallenge%20Plan%20-%20Thomas%20Van%20der%20Molen.docx).

Lastly, an unexpectedly large amount of time was actually taken away from my planned activities by the many exercises/workshops that I attended during the semester. These research topics (such as [ANN](https://github.com/Thomas-Molen/FHICT-S7-AI/tree/main/BOIANNRecognition), [CNN](https://github.com/Thomas-Molen/FHICT-S7-AI/tree/main/TrafficSignTransferredRecognition), Transformers ([NLP](https://github.com/Thomas-Molen/FHICT-S7-AI/tree/main/NaturalLanguageProcessing) lectures), [Reinforcement Learning](https://github.com/Thomas-Molen/FHICT-S7-AI/tree/main/ReinforcementLearning) and even the [theory behind chance mathematics](https://github.com/Thomas-Molen/FHICT-S7-AI/tree/main/NaiveBayesCoinSimulation)) ended up taking significantly more time than was planned for (by Fontys), as I wanted to spend additional time processing feedback and gaining a more in-depth understanding of the topics than the exercises brought on their own.

# Unplanned Work

During the semester, me (and a lot of other students) ended up spending significantly more time on some of the AI semester’s exercises than planned. This extra time spent on some topics ended up eating into my designated time for the Open Program (alongside the extra limited time pressure due to my job as a lead developer for some very active projects at the same time, including mentoring a graduation student at the time).

During the early parts of the semester, deep neural networks were covered in the ANN/CNN exercises, I wanted to learn more about these topics due to pure interest and wanted to improve upon my implementations and find out the quirks with my approach via constant iteration based on discussions, research and feedback which is reflected in my implementations of the “small” [ANN](https://github.com/Thomas-Molen/FHICT-S7-AI/tree/main/BOIANNRecognition) and [CNN](https://github.com/Thomas-Molen/FHICT-S7-AI/tree/main/TrafficSignTransferredRecognition) projects.

My genuine want to gain a deeper understanding of the various AI topics, also came out after a lecture on the unintuitive idea of chance mathematics. I ended up [creating a simulator](https://github.com/Thomas-Molen/FHICT-S7-AI/tree/main/NaiveBayesCoinSimulation) that could prove over up to billions of iterations the thought process and mathematics behind conditional probability/Bayesian inference and the [double sided coin example](https://bestcase.wordpress.com/2014/08/12/a-bayesian-example-two-coins-three-heads/) (as described during the lecture).

Further into the semester however, the genuine want to gain a deeper understanding turned more into a need to do so for me to prove and properly support the research I was doing for the AI powered integrations testing and group (Predicting anomalous behavior in K8 clusters) projects. For this I spent a lot of time exploring the Reinforcement learning topics based on the [lectures given on this topic](https://github.com/Thomas-Molen/FHICT-S7-AI/tree/main/ReinforcementLearning), and spending significant amounts of fundamentally understanding and discussing with my technical teachers the technical workings of State Machines and Transformers based on the [NLP lectures](https://github.com/Thomas-Molen/FHICT-S7-AI/tree/main/NaturalLanguageProcessing).

# Graduation Internship Preparation

## Pre-semester preparations

(As discussed in the Open Program Plan) During previous semester, I spent a significant amount of time looking into what I want to do after my graduation, to find this out I talked and interviewed several people that gave me a clearer understanding and eventually pointed me in the direction of ZPP or Consultancy work.

During this semester then, my goal was to execute on my research and use everything I have learned to find the perfect graduation internship that will help me the most after my education.

## “Marketability”

The first part of my plan, was to improve my “marketability”, as in general I am quite bad at initiating talks with unknown people, but have been fairly good at proving my worth when I get to “prove myself”.

As a part of this, I [updated my CV](https://thomasmolen.com/files/CV-Thomas-Van-der-Molen.pdf) (which is a fairly normal thing to do), but used this during events such as the Career day, to start up conversations connecting their current needs to projects I have done in the past and instead of ending my conversation at them knowing my name or me writing out a form, I would be able to show them a QR-code that would directly open up my CV on their phones, thereby having them immediately seeing it, and most likely keeping it open in their browser tabs to remind them later on (a nice extra bonus, was that a lot of individuals were genuinely excited about my approach and way of sharing my CV which probably helped their perception of me further).

Next, I went back to my LinkedIn page, and asked previous companies I had worked with or were currently working with for recommendations to fill out my profile (which seemed to be successful, as it created positive conversation moments during some interviews).

Further, I also created a [portfolio website](https://thomasmolen.com/) that is circularly linked with my CV to hopefully feed people from my CV to my full portfolio and vice versa, with my portfolio website being set-up (based on feedback and discussions with similar target audience) to target the exact things a recruiter might be interested in including a full list of projects I have done [with working demos](https://thomasmolen.com/?project=VocabVersus#projects).

## Internship Candidates

To find the best internship for me, I created a [spreadsheet](https://docs.google.com/spreadsheets/d/1emdglR9FHcvxlTxmePtg5POw13pKHU7Rqjw6twRl2gQ/edit?usp=sharing) that contained all companies that I wanted to contact, all potential companies from the [ASAM portal](https://asam.fhict.nl/student/Search?Specialization=0d4410c4-b591-4742-9830-3cae2b7e0102&Level=Graduation&LocationQuery=&LocationRadius=0&Compensation=0&Query=), and companies that contacted me (primarily on LinkedIn).

This list allowed me to easily track the status of all companies and even had a tier list of my interest in them, allowing me to contact companies in waves depending on the response or lack there of from higher tiered companies.

## Results

While I ended up spending a lot of time contacting companies, going through the interview processes, etc. I ended up with a 3 potential companies I was willing to do my graduation internship at: [Waves Process Intelligence](https://wavespi.nl/) ([Konekti](https://getkonekti.io/)), [Info Support](https://infosupport.com/) & [BDO](https://www.bdo.mu/en-gb/services/bdo-it-consulting).

After going back and forth between the 3 left over companies, and asking valuable opinions from several different sources, I ended up choosing Info Support where I will be developing an automated system to help the Info Support Financial processes when handling hour registration/invoicing from their consultants.

# AI Powered Integration Tests

As we knew from the start of the semester that we would be spending the latter half of it working on an innovative data challenge, I was trying to come up with potential project from the start, and had formulated a couple that I was interested in.

One of my formulated projects was the idea to leverage AI to perform integration tests, and I had decided to spend a large part of my Open Program investigating the plausibility of this idea so that if proven reasonable, I could continue this idea as a Data Driven Innovation Challenge project.

To prove the idea reasonable as a Innovation Challenge, I explored a few target base ideas of the project that would hopefully prove the possibility of this potential project.

## Goal

The first part that should always be explored, is the goal of the idea as this could determine the scope and potential future research topics for the project. For this, the idea was limited to [web-applications](https://en.wikipedia.org/wiki/Web_application) (websites) and would later be exclusively targeted towards using a [Reinforcement Learning agent](https://www.mathworks.com/help/reinforcement-learning/ug/create-agents-for-reinforcement-learning.html) for the testing process. Beyond this however, the idea had one more stipulation that could set it apart and allow for an extra layer of innovation; the idea that the tool should take zero integration from the web-application itself thereby making the tool applicable to any website.

## Similar Products

As a part of the [DOT Framework research methods](https://ictresearchmethods.nl/library/available-product-analysis/), exploring work that other people might have already done in a similar context or on a similar problem could give valuable information, especially when trying to establish the feasibility of an idea.

Out of this research, some possible products were found notably: [Applitools](https://applitools.com/), [Testim](https://www.testim.io/), [Mabl](https://www.mabl.com/), [Perfecto](https://www.perfecto.io/) & [Test.ai](https://test.ai/all-products). Ironically, all of these companies use similar selling points of utilizing AI to test and improve the quality of products, yet none of them actually use AI in this manner, as from the research done it was found that most of the “AI-powered” testing tools either use a form of [GitHub copilot](https://github.com/features/copilot) to help write tests, which as you might expect, copilot itself could already provide, and the tools that did provide some form of fully autonomous testing, did so in the form of “visual testing” by checking the validity of page’s HTML, which while a valid testing procedure generally does not require any AI tools, and are provided by free tools such as [Google Lighthouse](https://chromewebstore.google.com/detail/lighthouse/blipmdconlkpinefehnmjammfjpmpbjk?hl=nl).

## Downsides

“your scientists were so preoccupied with whether or not they could that they didn't stop to think if they should” (Jurassic Park, 1993).

While a definite gap in the market seems to still exist for an idea like this, and the scope seems to be reasonable, there are also downsides to consider with this potential project. The malicious use of a tool that could find incorrect behavior on any web-page (think of a bug with a login page) could be used to improve web security or make it worse exclusively dependent on who uses it, or the energy/environmental concerns, AI has been fighting an uphill battle with the efficiency of using these extremely powerful tools no matter the resources it might consume, which something like an AI based testing solution might only make worse for what could be considered very little reward.